

PTO 1390 Page 1 of 1

US Dept. of Commerce Pat. &amp; Trademark Office

Attorney's Docket No.

21753

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 USC 371

US. Application No. (if known)

09/786802

INTERNATIONAL APP. NO.

PCT/EP99/06257 ✓

INTERNATIONAL FILING DATE

26 August 1999 ✓

PRIORITY DATE CLAIMED

8 September 1998 ✓

TITLE OF INVENTION

BLADES FOR CUTTING MOVING WEBS OF MATERIAL ✓

APPLICANT(S) FOR DO/EO/US

Hans RÜCKERT et al

Applicant herewith submits to the United States Designated/Elected Office (DO/EU/US) the following .

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 USC 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 USC 371.
3. ☐ This is an express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 USC 317(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 USC 371(c)(2)).
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau.
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Patent Office.
6. ☒ A translation of the International application into English.
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau.
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 USC 371(c)(3).
9. ☐ An oath or declaration of the inventor(s) (35 USC 371(c)(4).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 USC 371(c)(5)).

Items 11. to 16. below concern documents or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An Assignment for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items of information.
  - Drawing (1 sheets)
  - References
  - PTO-1449

US Application no (if known) <b>09/786802</b>	International Application no. <b>PCT/EP99/06257</b>	Attorney's Docket No. <b>21753</b>
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17. The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5): Search report has been prepared by the EPO or JP ..... \$860.00 Int'l prel. exam. fee paid to USPTO (37 CFR 1.482) ..... \$690.00 No int'l prel. exam. fee paid to USPTO (37 CFR 1.482) but int'l search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$710.00 Neither int'l prel. exam fee (37 CFR 1.482) nor int'l search fee (37 CFR 1.455(a)(2)) paid to USPTO ..... \$1000.00 Intl. prel. exam. fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Art. 33(2-4) ..... \$100.00  ENTER APPROPRIATE BASIC FEE AMOUNT				CALCULATIONS PTO USE ONLY  <b>JCS Rec'd PCT/PTO 07 MAR 2001</b>	
Surcharge of \$130.00 for furnishing oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).					
CLAIMS	NO. FILED	NO. EXTRA	RATE		
Total claims	9	0	\$18	\$0	
Ind. claims	0	0	\$80	\$0	
MULTIPLE DEP. CLAIM(S) (if applicable) (see prel. amt.)			270		
TOTAL OF ABOVE CALCULATIONS				\$1,000	
Reduction of 1/4 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (37 CFR 1.2, 1.27, 1.28)				\$0	
SUBTOTAL				\$1,000	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).					
TOTAL NATIONAL FEE				\$1,000	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The Assignment may be accompanied by an appropriate PTO-1595 cover sheet (37 CFR 3.28, 3.39)					
TOTAL FEES ENCLOSED				\$1000	
				Amt to be refunded	
				Amt to be charged	

- a. ☒ A check in the amount of **\$1,000.00** to cover the above fees is enclosed  
 A check in the amount of \$ to cover recordal of the Assignment
- b. ☐

Please charge my deposit account 18-2025 \$ to cover the above fees. A copy of this sheet is enclosed.

- c. ☒ The commissioner is authorized to charge any additional fees which may be required or credit any overpayment to deposit account 18-2025. A copy of this sheet is enclosed

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:

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Herbert Dubno, Reg. No. 19,752

09/786802

JCS Rec'd PCT/PTO

07 MAR 2001

21753



IN THE U.S. PATENT AND TRADEMARK OFFICE

Inventor                      Hans RÜCKERT et al  
Patent App.                  Not known (US Nat'l phase of PCT/EP99/06257)  
Filed                          Concurrently herewith  
For                            BLADES FOR CUTTING MOVING WEBS OF MATERIAL  
Art Unit                      Not known  
Hon. Commissioner of Patents  
Washington, DC 20231

PRELIMINARY AMENDMENT

Prior to examination of the above-identified application,  
please amend as follows:

In the claims:

Cancel claims 1 through 7 without prejudice.

Add the following new claims:

1        --            8. A blade for cutting a moving material web with a  
2        blade body that has a steel cutting edge, characterized in that at  
3        least a surface of the cutting edge is coated by means of a plasma-  
4        aided method with foreign ions to a depth between 50  $\mu\text{m}$  and 500  $\mu\text{m}$ .

1                    9. The blade defined in claim 8 wherein the depth is  
2        between 100  $\mu\text{m}$  and 200  $\mu\text{m}$ .

1           10. The blade defined in claim 8 wherein at least the  
2 cutting edge has a hardness of 800 HV to 1300 HV without impairing  
3 ductility.

1           11. The blade defined in claim 10 wherein the hardness  
2 is between 900 HV and 1200 HV.

1           12. The blade defined in claim 8 wherein at least the  
2 cutting edge is formed of a heat-treated steel, a high-speed steel,  
3 or a tool steel.

1           13. The blade defined in claim 13 wherein the entire  
2 blade body is formed of a heat-treated steel, a high-speed steel,  
3 or a tool steel.

1           14. The blade defined in claim 8 wherein the foreign  
2 ions are of nitrogen, carbon, molybdenum, tungsten, and/or tita-  
3 nium.

1           15. The blade defined in claim 15 wherein the portion of  
2 foreign ions that are molybdenum or tungsten ions is smaller than  
3 the portion that is titanium ions.

1           16. An apparatus for longitudinally cutting a moving  
2 material web, in particular a paper or cardboard web or a plastic  
3 or metal foil with one or more pairs of circular blades each

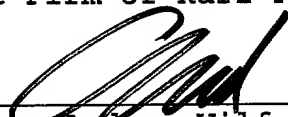
4 comprised of pair of blades wherein at least a cutting edge of the  
5 blades is coated as defined in claim 8. --.

Remarks:

This amendment is submitted in an earnest effort to  
advance this case to issue without delay.

The claims have been replaced with a set of claims that  
have no multiple dependencies.

Respectfully submitted,  
The Firm of Karl F. Ross P.C.

  
by: Andrew Wilford, 26,597  
Attorney for Applicant

5 March 2001

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21753 PCT/EP99/06257

1/PRTS

Transl. of WO 00/13860

## DESCRIPTION



## Blade for Cutting a Moving Material Web

## FIELD OF THE INVENTION

5 The invention relates to a blade for cutting a moving material web, in particular for cutting paper or cardboard webs or plastic or metal foils.

## STATE OF THE ART

10 In treatment machines for paper or cardboard webs or plastic or metal foils different types of blades are used in order to cut the moving webs longitudinally or transversely. Thus roll-cutting machines for paper or cardboard webs or plastic foils normally have a longitudinal-cutting device with several pairs of circular blades that each cut a strip out longitudinally. Thus a wide material web is cut into smaller strips that are subsequently wound up on rolls. Transverse cutting machines to make individual sheets from a material web have in addition to a longitudinal cutting device a transverse cutting device that typically is formed of two cutting drums that each have a surface equipped with one or more transverse blades extending over the length of the drum.

20 The pairs of circular blades of longitudinal cutting devices each have a cup-shaped blade supporting the web during

cutting and a piercing blade engaged into the web with the cutting edges held in an exact desired cut position. Typically the lower cup-shaped blade is driven while the disk-shaped piercing blade is positioned above it and is freely rotatable (German 3,419,843).

5           Normally the circular blades in longitudinal cutting devices and the transverse blades in transverse cutting devices are made of steel. They are subject when cutting to substantial wear and thus must be resharpened or replaced at regular intervals. In order to get a clean cut it is necessary to exactly position the  
10 blades and maintain this position.

          In order to increase the service life of the blades it is known from EP 0,297,399 to make the cutting edges from a hard metal. The application of one or more layers of a hard material to a strip blade is described in EP 0,327,530. A moderately alloyed  
15 preferably not stainless steel but rather carbon steel blade is provided at its edge by means of a pulsed CPVD method with a hard layer of nitride, carbide, and/or oxide, carbon nitride and/or oxycarbonitride of the elements of Groups IVb, Vb, or VIB of the periodic table or a nitride of boron, aluminum, silicon, molybde-  
20 num, tungsten, or a titanium carbonitride and/or titanium nitride.

          The technical procedure of ion implantation for reducing wear of steel is described in the brochure "Plasma-aided Method of Surface Treatment" of the organization Plasmaoberflächen-Technology of the German Gesellschaft für Galvano- und Oberflächentechnik e.  
25 V. of Horionsplatz 6, D-40213 Dusseldorf. With ion implantation

bombardment of surfaces with energy-rich ions of chemical elements imbeds these in the surfaces of these materials.

#### SUMMARY OF THE INVENTION

It is an object of the invention to provide a blade for cutting moving material webs that is inexpensive to manufacture but has a long service life even when cutting abrasive paper or cardboard webs.

This object is achieved by the features of claim 1.

According to the invention a blade body has a steel cutting edge. At least a surface of the cutting edge is coated by means of a plasma-aided CPVD method with foreign ions to a depth between 50  $\mu\text{m}$  and 500  $\mu\text{m}$ , preferably 100  $\mu\text{m}$  to 200  $\mu\text{m}$ . This dosing with foreign ions in the metal lattice optimally improves hardness for cutting without making the steel too brittle or influencing its ductility. Preferably, as described in claim 2, foreign ions are layered such that at least the cutting edge has a hardness of 800 HV to 1300 HV, preferably 900 HV to 1200 HV, in particular 950 HV to 1050 HV. According to the invention circular blades with such a hardness have a service life in longitudinal cutting devices that is increased by a multiple without the cutting edges failing under stress. Such blades can cut with great accuracy.



Particularly suitable is coating with nitrogen, carbon, molybdenum, tungsten, and/or titanium in variable quantities per mole of steel. The portion of foreign ions that are molybdenum or tungsten ions is smaller than the portion that is titanium ions.

5 The steel at least for the cutting edge and preferably for the entire blade body is preferably a heat-treated steel, preferably a rolled steel, a high-speed steel, or tool steel, in particular a cold-worked steel, for example a high-alloy chromium-vanadium steel.

#### 10 BRIEF DESCRIPTION OF THE DRAWING

The drawing serves for describing the invention by means of a simplified illustrated embodiment.

FIG. 1 is a section through a pair of circular cutters of a longitudinal cutting device for cutting paper or cardboard webs.

#### 15 EMBODIMENT OF THE INVENTION

The pair of circular blades includes as upper blade 1 a disk-shaped circular blade and as lower blade 2 a cup-shaped circular blade. Such blade shapes are described for example in German 3,419,843 or EP 0,297,399.

20 The upper blade 1 has a disk-shaped blade body 3 with a central hole 4 that is fitted to a bearing on a blade shaft and

secured thereto. The blade body 3 has a frustoconical outer edge that forms a sharp cutting edge 5.

The lower blade 2 has a cup-shaped blade body 6 that also has a central hole 7 through which passes a shaft of a longitudinal cutting device. A cutting edge 8 of the cup-shaped lower blade 2 is formed at a radial outer edge of a cylindrical part 9 of the blade body 6 that is bent off perpendicular to the hole 7 and parallel to the blade shaft.

At least in the region of the cutting edges 5 and 8 of the blades 1 and 2 and preferably the entire blade bodies 3 and 6 including the cutting edges 5 and 8 are of steel. Preferably a worked steel, a roller-bearing steel, a high-speed steel, or a tool steel is used that is subsequently treated in the below-described manner. Circular blades for longitudinally cutting paper or cardboard webs are ideally made starting from a cold-worked tool steel, in particular a high-alloy chromium-vanadium steel.

After making the basic shape of the blade bodies 3 and 6 at least the cutting edges 5 and 8 and preferably the entire blade bodies 3 and 6 are treated by means of a plasma-aided method by ion implantation so that foreign ions are implanted from outside in the outer regions of the metal lattice. Dosing with foreign ions is done such that foreign ions penetrate to a depth of 50  $\mu\text{m}$  to 500  $\mu\text{m}$ , preferably 100  $\mu\text{m}$  to 200  $\mu\text{m}$ . The foreign ions are nitrogen, carbon, molybdenum, tungsten and/or titanium ions. Preferably the proportion of molybdenum or tungsten ions is greater than the proportion of titanium ions.

The type of foreign ion, the treatment temperature, and the treatment time of the pulsed plasma are set such that at least the cutting edges 5 and 8 and preferably the entire blade bodies 3 and 6 attain a Vickers hardness of 800 HV to 1300 HV, preferably 900 HV to 1200 HV. For circular blades for longitudinal cutting a hardness of 950 HV to 1050 HV is particular suitable. The treatment temperature in the plasma during treatment attains 180°C to 350°C, preferably 220°C to 280°C.

## PATENT CLAIMS

1. A blade for cutting a moving material web with a blade body that has a steel cutting edge, characterized in that at least a surface of the cutting edge is coated by means of a plasma-aided method with foreign ions to a depth between 50  $\mu\text{m}$  and 500  $\mu\text{m}$ , preferably 100  $\mu\text{m}$  to 200  $\mu\text{m}$ .

2. The blade according to claim 1, characterized in that at least the cutting edge (5 or 8) has a hardness of 800 HV to 1300 HV, preferably 900 HV to 1200 HV, in particular 950 HV to 1050 HV, without impairing ductility.

3. The blade according to claim 1 or 2, characterized in that at least the cutting edge (5 or 8) and preferably the entire blade body (3 or 6) is formed of a heat-treated steel, a high-speed steel, or a tool steel, in particular a cold-worked steel.

4. The blade according to one of claims 1 to 3, characterized in that the foreign ions are of nitrogen, carbon, molybdenum, tungsten, and/or titanium.

5. The blade according to claim 4, characterized in that the portion of foreign ions that are molybdenum or tungsten ions is smaller than the portion that is titanium ions.

6. An apparatus for longitudinally cutting a moving material web, in particular a paper or cardboard web or a plastic or metal foil with one or more pairs of circular blades each comprises of an upper blade (1) and a lower blade (2), characterized in that the upper blade (12) and/or the lower blade (2) is a circular blade with the features of one or more of claims 1 to 5.

7. An apparatus for transversely cutting a moving material web, in particular a paper or cardboard web with a blade drum that is fitted on its surface with one or more transverse blades extending a full length of the drum, characterized in that the transverse blade is formed according to one or more of claims 1 to 5.

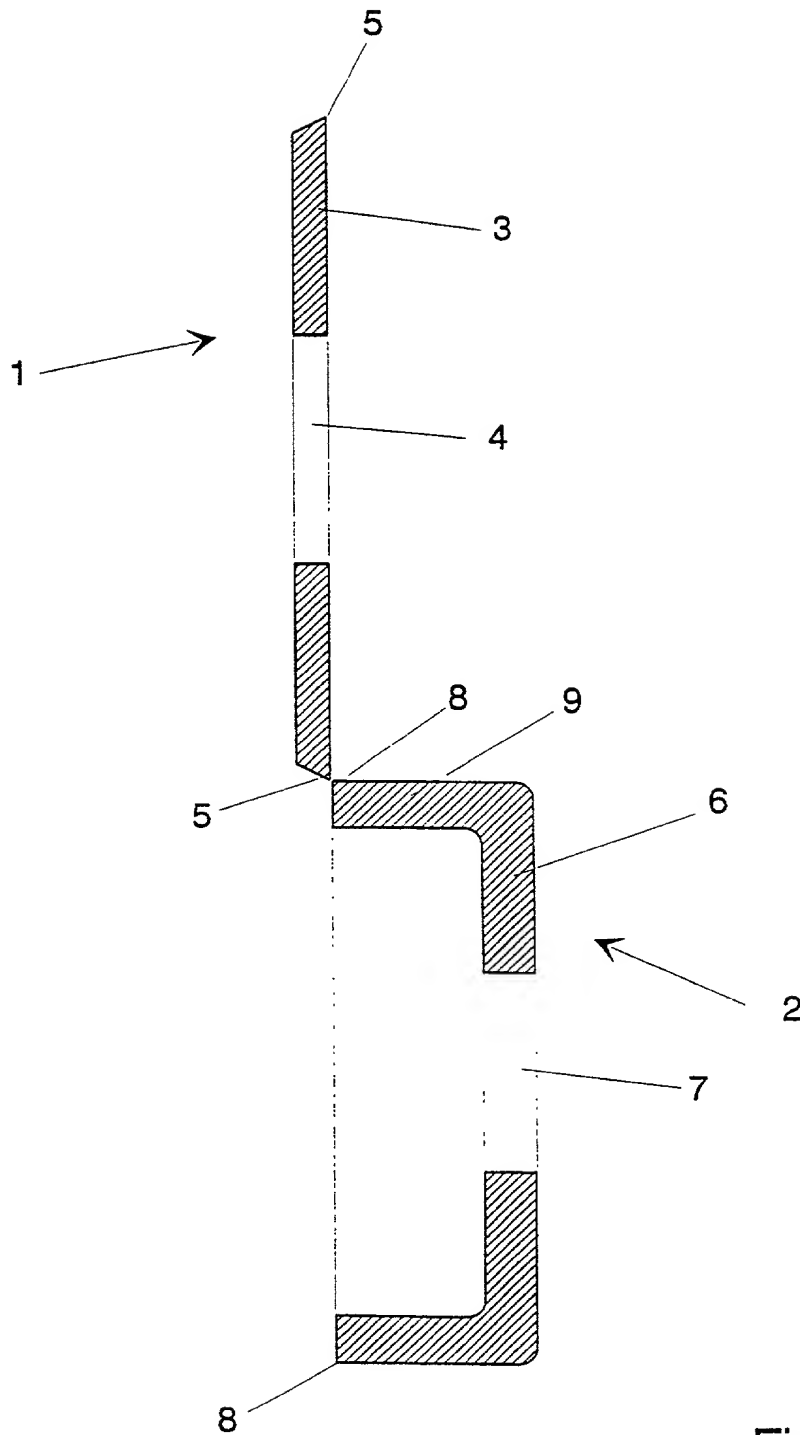


Fig. 1

M. JS 0400. US

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**DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare that: My residence, post-office address, and citizenship are as stated below next to my name.

I believe that I am an original joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

**BLADES FOR CUTTING MOVING WEBS OF MATERIAL** ✓

the specification of which was filed on **26 August 1999** ✓ as PCT application **PCT/EP99/06257**. ✓

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 USC 119 of any foreign applications for patent or inventor's certificate listed below and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

**Prior Foreign Applications**

Country	Number	Filing Date	Priority claimed
DE ✓	19840950.8 ✓	8 September 1998 ✓	Yes

I hereby claim the benefit under 35 USC 120 of the United States Application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States Application(s) in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose material information as defined in 37 CFR 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Serial Number	Filing Date	Status
PCT/EP99/06257 ✓	26 August 1999 ✓	Pending

I hereby appoint as attorneys to prosecute this application and to transact all business connected therewith: **Herbert Dubno, Reg. 19,752; Jonathan Myers, Reg. 26,963; Andrew Wilford, Reg. 26,597** and each of them individually.

Address all correspondence to:

**The Firm of Karl F. Ross, P.C.**

**Customer Number 535**

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**Riverdale (Bronx), New York 10471-0900**  
**(718) 884-6600**

Direct all telephone calls to:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or

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Ser. No. Not known - US phase of PCT/EP99/06257

both, under 18 USC 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor:

**Hans RÜCKERT**

Inventor's signature

*X Hans Rückert*

Date:

*X 29.03.2001*Residence: **Ratingen, Germany** *DEX*

Citizen of Germany

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Full name of second inventor:

**Ulrich SCHOOF**

Inventor's signature

*X Ulrich Schoof*

Date:

*X 26.03.2001*Residence: **Düsseldorf, Germany** *DEX*

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